

**University of Cincinnati**  
 Office Division | February 23, 2023



## Gouda (how-da) Build

### Project Summary

University of Cincinnati's team is a concert of 7 students with diverse professional experiences carefully handpicked to compliment the strengths of each individual. Our team was tasked with designing an office building for an Architecture, Engineering, and Construction (AEC) firm that specializes in sustainable buildings utilizing renewable technologies. The office building is to be built in Gouda, Netherlands, a location whose culture is very different from the culture our team has experience with. Great care has gone into learning about, respecting, and designing for the people of Gouda. The office is to be built in an "energy corridor" alongside the new construction of a school, RV sales, and senior housing complex. Careful planning and execution have gone into the design ensuring that all new construction within the energy corridor work together for the ultimate occupant experience.



### Design Strategy

Gouda Build is a showcase for how-to-build in the future. Utilizing a number of on-site net-zero energy strategies designed with the intention of viewing accessibility from occupants within. Among these strategies showcased are; green roof, south buffer façade, PV panel array, solar thermal panel array, and geothermal system.

Our team understands that a sustainable future is highly reliant on the generations to follow leading to the addition of the do-it-yourself lab intentionally placed on the corner closest to the school building for ease of access to students allowing for a proper hands-on learning experience often led by professionals within the firm.

### Project Data

- **Location:** Gouda, Holland, Netherlands
- **Climate Zone:** Maritime climate
- **Lot Size:** 0.75
- **Building Size: (3 stories) 23,235 ft<sup>2</sup>**
- **Occupancy:** # of people (ft<sup>2</sup>/person)
- **Construction Cost:** \$626.60/ft<sup>2</sup>
- **Energy Performance:** Source EUI (kBtu/ft<sup>2</sup>/yr)
  - 44.5 without renewable energy source
  - 0.0 with renewable energy source
- **Average Utility Cost:** 0.00\$/month
- **Annual Carbon Emissions:** ton CO<sub>2</sub>e/ft<sup>2</sup>/yr

### Technical Specifications

#### R-Values

- Wall: 60
- Foundation: 15
- Double Façade: 13
- Roof: 60
- Windows: 6

#### HVAC

- Geothermal/Solar Thermal/DOAS

#### On-Site PV

- 100 kW

## Project Highlights

### Architecture

Gouda Build is a new cross laminated timber (CLT) structure, programed for an Architecture, Engineering, and Construction (AEC) firm that specializes in sustainable buildings. With the Do-It-Yourself (DIY) lab we allow our clients to be hands-on with renewable energy technology.

### Engineering

We have utilized solar thermal and photovoltaic panels for energy generation coupled with an absorption chiller and geothermal heat pump. Cross laminated timber (CLT) is used as the main above grade structural component and we have utilized triple glazed windows, a double skinned façade, and continuously insulated high R value walls.

### Market Analysis

Energy prices in the Netherlands have spiked drastically to 114% higher than in September of 2021. With no clear expected timing for energy costs to return to normal, our project has a focus to combat the energy crisis head-on.

### Durability and Resilience

The selection of materials, wall assemblies, and structural components emphasize durability and functionality. Cross Laminated Timber (CLT) being used as the main structure with insulated metal panels reduce the day-to-day wear on our building, allowing us to have a longer building life.

### Embodied Environmental Impact

Construction uses a large amount of energy to harvest raw materials, manufacture them into building components, and transport them to the site. We estimated the embodied carbon emissions emitted in these processes specifically for our building and location in order to evaluate the holistic impact of Gouda Build as a “sustainable building”.

### Integrated Performance

Heating and Cooling loads make up the largest portion of our energy consumption, therefore our team has implemented systems that work together to decrease those loads and passively supply them. The envelope consists of high resistance materials and airtight connections and we are utilizing a double skinned facade to maximize daylighting and shading. The HVAC system is powered by solar thermal, geothermal, and photovoltaics with zones laid out to stimulate air flow and natural ventilation.

### Occupant Experience

The integrated use of Radiant Flooring, Passive Heating/Cooling through the Double Skin Curtain Wall and a complete Dedicated Outdoor Air System allows Gouda Build to be a comfortable experience, able to meet the heating/cooling needs of all occupants. These systems, when coupled with ample outdoor green space and large amounts of direct sunlight, provide an excellent occupant experience.

### Comfort and Environmental Quality

Comfort was considered primarily in our designs. We want a building that encourages a healthy and productive environment whether that be for the community members visiting or the employees that are working within.

### Energy Performance

Gouda Build utilizes a number of on-site net-zero energy strategies all working together to bring the baseline source EUI of 44.5kBtu/sf to 0kBtu/sf and deeming our building net-zero.